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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN AND RELATING TO ELECTRIC MOTOR VOLTAGE DEPENDENT COMMUTATORS

(71) We, C. CONRADTY, of Postfach 480, 8500 Nürnberg 2, Germany, a German Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to electric motor voltage dependent commutators, more particularly for fractional-horse power and electric instrument motors.

The commutation of an electric motor may be carried out by means of copper commutators, the individual copper segments being fixed on a supporting member of insulating material. The commutators may be in disc or cylinder form.

When the commutation of an electric motor is carried out in this way, voltage peaks are caused through the sudden interruption of the circuit on the transition of a brush from one segment of the commutator to another. An electromotive force is produced in consequence of the self-induction of the winding:

$$e = -L \cdot di/dt$$

The induced voltage is added on to the voltage applied to the terminals of the motor, which causes sparks to be formed between the commutator and the brushes. This spark formation gives rise to disturbances in radio and television sets and in radio and electronic installations and leads to premature wear of the commutator and brushes.

As is known, interference suppression can be carried out by connecting voltage dependent resistors in parallel with the corresponding rotor coils of the electromotor. (VDR=voltage dependent resistor). The voltage dependent resistor consist predominantly of silicon carbide with a ceramic bond.

The installation of voltage dependent resistors for the purpose of interference suppression and lengthening of the life of electric motors is sometimes performed by soldering three small resistance discs into the rotor winding. This construction however results in a lack of dynamic balance during the operation of the motor and shorter running times due to damage to bearings.

The imbalances can be prevented by the use of VDR rings pushed on to the motor shaft. These VDR rings are provided on one of their two faces, or on both faces, with segment-shaped contacts, spaced approximately 1.0 mm apart. The voltage dependent resistors are connected in parallel with the corresponding rotor coils. After the VDR ring has been soldered the commutator must then also be pushed onto the motor shaft, fixed, and also soldered.

It is an object of the invention to provide a voltage dependent commutator which combines in a single component the properties of a voltage dependent resistor ring and a commutator.

The invention according to one aspect consists in an electric motor voltage dependent commutator, comprising a voltage dependent resistor in disc or cylindrical form on to which commutator segments are applied in an electrically conductive manner, thereby resulting in a component having the properties of a voltage dependent resistor and a commutator.

Another aspect of the invention consists in a method of producing an electric motor voltage dependent commutator, which comprises applying an electrically conductive coating to a disc-shaped or a cylindrical voltage dependent resistor, said coating having the shape of segments or strips and constituting commutator segments.

According to yet another aspect of the invention there is provided a method of producing an electric motor voltage dependent commutator, wherein commutator segments stamped out of conductive sheet material

e.g. copper, are soldered or conductively bonded to a disc-shaped or a cylindrical voltage dependent resistor.

A still further aspect of the invention consists in a method of producing an electric motor voltage dependent commutator, which comprises applying an electrically conductive coating to a disc-shaped or a cylindrical voltage dependent resistor, said coating having the shape of segments, and soldering or conductively bonding to said coating commutator segments stamped out of conductive sheet material, e.g. copper.

In order to make the invention clearly understood, reference will now be made to the accompanying drawings which are given by way of example and in which:—

Fig. 1 is a plan view of a disc-shaped commutator;

Fig. 2 represents a section through the commutator of Fig. 1.

Fig. 3 shows a cylindrical commutator; and

Fig. 4 is a cross-section through the commutator of Fig. 3.

The commutators illustrated comprise in each case a disc-shaped or a cylindrical voltage dependent resistor 1 with three, or any desired number of commutator segments 2 situated thereon, of conductive sheet material, such as copper, and serving on the one hand for the contacting of the resistor and on the other as the commutator. The segments 2 are spaced by gaps 4.

The commutator segments 2 are connected to the resistor 1 by a conductive coating 3, and connection to rotor coils is made at the solder lugs 5.

Reference will now be made to four examples:—

Example 1:

A ring shaped or a cylindrical voltage dependent resistor is sprayed with a metallic coating. In the case of a ring-shaped voltage dependent resistor the coating is of segmental shapes (see Figure 1) whilst in the case of a cylindrical voltage dependent resistor the coating consists of strips parallel with the longitudinal axis (see Figure 3). The commutator segments formed by said shapes or strips are reinforced by plating and are subsequently polished.

Example 2:

A ring-shaped or a cylindrical voltage dependent resistor is provided with a metallic coating as in example 1. Commutator segments stamped from sheet copper approximately 0.5 mm thick, are either soldered on to the coated face or bonded thereto by a conductive adhesive. The commutator segments have solder lugs on their outer side, for soldering to rotor coils.

Example 3:

A ring-shaped voltage dependent resistor is provided with a metallic coating as in Example 1. To ensure a precise spacing between the individual commutator segments which are stamped from sheet copper, the stamped segments remain connected together at their centre. Thus in one operation the segments are soldered or bonded conductively on to the coated face of the voltage dependent resistor, maintaining a precise distance from one another. The centre web which remains is stamped out or drilled out after the commutator segments have been fixed to the voltage dependent resistor, so that the segments are no longer electrically connected to one another.

Example 4:

A further simplification in relation to Examples 2 and 3 is obtained by coating the commutator segments of sheet copper with conductive adhesive before or after the stamping, and pressing them on to an uncoated voltage dependent resistor. The remaining centre web is thereafter stamped or drilled out, as in Example 3. Solder lugs are provided.

WHAT WE CLAIM IS:—

1. An electric motor voltage dependent commutator, comprising a voltage dependent resistor in disc or cylindrical form on to which commutator segments are applied in an electrically conductive manner, thereby resulting in a component having the properties of a voltage dependent resistor and a commutator.

2. An electric motor voltage dependent commutator constructed and arranged substantially as hereinbeforedescribed with reference to and as illustrated in the accompanying drawnigs.

3. A method of producing an electric motor voltage dependent commutator, which comprises applying an electrically conductive coating to a disc-shaped or a cylindrical voltage dependent resistor, and coating having the shape of segments or strips and constituting commutator segments.

4. A method as claimed in Claim 3, wherein the coating is reinforced by plating.

5. A method of producing an electric motor voltage dependent commutator, wherein commutator segments stamped out of conductive sheet material e.g. copper, are soldered or conductively bonded to a disc-shaped or a cylindrical voltage dependent resistor.

6. A method of producing an electric motor voltage dependent commutator, which comprises applying an electrically conductive coating to a disc-shaped or a cylindrical voltage dependent resistor, said coating having the shape of segments, and soldering or conductively bonding to said coating com-

mutator segments stamped out of conductive sheet material, e.g. copper.

7. A method as claimed in Claim 5 or 6, wherein the commutator segments are soldered or conductively bonded to the voltage dependent resistor or to the said coating while in the form of a single interconnected piece.

8. A method as claimed in Claim 7, wherein the commutator segments are separated, after the operation of soldering or bonding, by stamping or drilling out central webs.

9. A method as claimed in any one of the Claims 5 to 7, wherein the conductive sheet material is coated with a conductive adhesive before being stamped out.

10. A method of producing an electric motor voltage dependent commutator substantitally as hereinbefore described and with reference to any of the foregoing examples.

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1337343 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG. 1

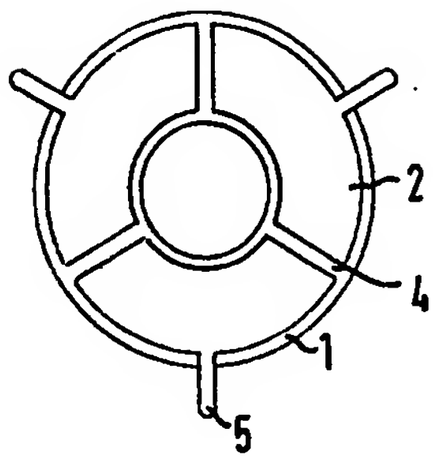

FIG. 3

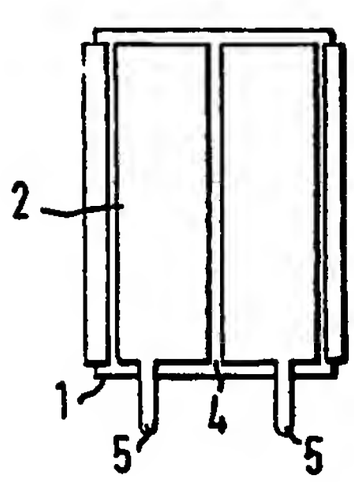

FIG. 2

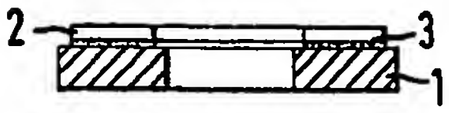

FIG. 4